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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/725,257

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Ming-Jey Yang

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NAVAL RESEARCH LABORATORY

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EXAMINER

THOMAS, TONIAE M

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 06/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EX

Office Action Summary	Application No. 10/725,257	Applicant(s) YANG ET AL.	
	Examiner Toniae M. Thomas	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4,5 and 11-18 is/are rejected.
- 7) ☒ Claim(s) 2, 3, 6-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is a first Office action on the merits of Application Serial No. 10/725,257, which is a divisional of Application Serial No. 10/320,419 filed on 17 December 2002, now US Patent No. 6,703,639. Currently, claims 1-18 are pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Tehrani et al. (US 5,349,214).

The Tehrani et al. patent (Tehrani) discloses a method of fabricating a heterostructure device (fig. 7 and accompanying text). The method comprises the steps of: providing a buffer layer 24 (fig. 7 and col. 7, lines 45-56); growing a bottom barrier layer 28 on the buffer layer (fig. 7 and col. 7, lines 45-56);

Art Unit: 2822

growing a quantum well layer 29 on the bottom barrier layer (fig. 7 and col. 7, lines 45-56); growing a top barrier layer 32 on the quantum well layer (fig. 7 and col. 7, lines 45-56); forming a p-doped cap layer 33, 34 on the top barrier layer (fig. 7 and col. 7, lines 45-56); and etching a portion of the cap layer to form conducting electrons in the quantum well layer below the etched portion of the cap layer (col. 6, lines 53-68).

The cap layer comprises no more than one InAs cap layer 34 (col. 7, lines 45-56).

The step of forming a p-doped cap layer comprises the step of forming alternating layers of p-doped material having differing Fermi level values (col. 7, lines 28-31 and col. 7, lines 45-56).

3. Claims 11 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Watanabe et al. (US 2002/0119661 A1).

The Watanabe et al. pre-grant published application (Watanabe) discloses a method of etching (figs. 17A-17E and accompanying text). The method comprises the steps of: providing a heterostructure (par. 176, lines 1-6; providing an etchant solution (par. 179, lines 1-4); and contacting the etchant solution to the heterostructure to etch the heterostructure (fig. 17D and par. 179, lines 1-4). In one embodiment, the etchant comprises acetic acid, hydrogen peroxide, and water (par. 264, lines 9-15).

The heterostructure comprises InAs (par. 176, lines 1-6).

Art Unit: 2822

4. Claims 14 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Boos et al. (US 5,798,540).

The Boos et al. patent (Boos) discloses a method of etching (figs. 1, 2 and accompanying text). The method comprises the steps of: providing a heterostructure (fig. 1 and col. 3, lines 53-58); providing an etchant solution comprising hydrofluoric acid, hydrogen peroxide, and lactic acid (col. 4, lines 54-61); and contacting the etchant solution to the heterostructure to etch the heterostructure (fig. 2 and col. 4, lines 42-53).

In one embodiment, the heterostructure comprises $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ (col. 3, lines 45-47).¹

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe.

While Watanabe discloses using an etchant comprising acetic acid, hydrogen peroxide, and water, Watanabe does not teach that the ratios of the

¹ The $\text{In}_x\text{Al}_{1-x}\text{As}_y\text{Sb}_{1-y}$ may be replaced with AlGaAsSb (col. 3, lines 45-47).

Art Unit: 2822

acetic acid, hydrogen peroxide, and water in the etchant solution are from about 5:10:100 to about 5:10:200 by volume. However, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide an etchant comprising acetic acid, hydrogen peroxide, and water such that the etchant has the claimed range of ratios by volume, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boos.

While Boos discloses using an etchant comprising hydrofluoric acid, hydrogen peroxide, and lactic acid, Boos does not teach that the ratios of the hydrofluoric acid, hydrogen peroxide, and lactic acid in the etchant solution are from about 5:10:100 to about 5:10:200 by volume. However, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide an etchant comprising hydrofluoric acid, hydrogen peroxide, and lactic acid such that the etchant has the claimed range of ratios by volume, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

7. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boos in view of Roman Jr. et al.

Boos discloses a method of etching $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ (figs. 1, 2 and accompanying text).² The method comprises the steps of: providing an $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ heterostructure (col. 3, lines 45-47); providing an etchant solution (col. 4, lines 54-61); and contacting the etchant solution to the heterostructure to etch the heterostructure (col. 4, lines 42-47).

While Boos teaches providing an etchant solution and contacting the etching solution to the heterostructure, Boos does not teach that the etchant comprises AZ400K and water. The Roman Jr. et al. pre-grant published application (Roman) teaches the use of an etchant comprising AZ400K and water (par. 76, lines 17-18). The ratio of the AZ400K and water in the etchant solution is about 1:4 by weight (par. 76, lines 17-18).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Boos by using an etchant comprising AZ400K and water, as taught by Roman, because the etchant is a selective wet etchant that may be used in place of an etchant comprising hydrofluoric acid, hydrogen peroxide, and lactic acid to etch the heterostructure.

² See Footnote No. 1.

Allowable Subject Matter

8. Claims 2, 3, and 6-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday-Thursday from 8:30 a.m. to 5:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TMT
27 May 2005



Mary Wilczewski
Primary Examiner